

# SEQUENCE LISTING

<110> Rosanne M. Crooke  
Mark J. Graham

<120> ANTISENSE MODULATION OF MICROSOMAL TRIGLYCERIDE TRANSFER PROTEIN  
EXPRESSION

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<221> CDS

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Met Ile Leu Leu Ala Val Leu Phe Leu  
1 5

tgc ttc att tcc tca tat tca gct tct gtt aaa ggt cac aca act ggt 161  
Cys Phe Ile Ser Ser Tyr Ser Ala Ser Val Lys Gly His Thr Thr Gly  
10 15 20 25

ctc tca tta aat aat gac cgg ctg tac aag ctc acg tac tcc act gaa 209  
Leu Ser Leu Asn Asn Asp Arg Leu Tyr Lys Leu Thr Tyr Ser Thr Glu  
30 35 40

gtt ctt ctt gat cgg ggc aaa gga aaa ctg caa gac agc gtg ggc tac 257  
Val Leu Leu Asp Arg Gly Lys Gly Lys Leu Gln Asp Ser Val Gly Tyr  
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cgc att tcc tcc aac gtg gat gtg gcc tta cta tgg agg aat cct gat 305  
Arg Ile Ser Ser Asn Val Asp Val Ala Leu Leu Trp Arg Asn Pro Asp  
60 65 70

ggt gat gat gac cag ttg atc caa ata acg atg aag gat gta aat gtt 353  
Gly Asp Asp Asp Gln Leu Ile Gln Ile Thr Met Lys Asp Val Asn Val  
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| 75                |                   |                   |                   |                   | 80                |                   |                   |                   |                   | 85                |                   |                   |                   |                   |                   |      |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
| gaa<br>Glu<br>90  | aat<br>Asn        | gtg<br>Val        | aat<br>Asn        | cag<br>Gln        | cag<br>Gln<br>95  | aga<br>Arg        | gga<br>Gly        | gag<br>Glu        | aag<br>Lys        | agc<br>Ser<br>100 | atc<br>Ile        | ttc<br>Phe        | aaa<br>Lys        | gga<br>Gly        | aaa<br>Lys<br>105 | 401  |
| agc<br>Ser        | cca<br>Pro        | tct<br>Ser        | aaa<br>Lys        | ata<br>Ile<br>110 | atg<br>Met        | gga<br>Gly        | aag<br>Lys        | gaa<br>Glu        | aac<br>Asn<br>115 | ttg<br>Leu        | gaa<br>Glu        | gct<br>Ala        | ctg<br>Leu        | caa<br>Gln<br>120 | aga<br>Arg        | 449  |
| cct<br>Pro        | acg<br>Thr        | ctc<br>Leu        | ctt<br>Leu<br>125 | cat<br>His        | cta<br>Leu        | atc<br>Ile        | cat<br>His        | gga<br>Gly<br>130 | aag<br>Lys        | gtc<br>Val        | aaa<br>Lys        | gag<br>Glu        | ttc<br>Phe<br>135 | tac<br>Tyr        | tca<br>Ser        | 497  |
| tat<br>Tyr        | caa<br>Gln        | aat<br>Asn<br>140 | gag<br>Glu        | gca<br>Ala        | gtg<br>Val        | gcc<br>Ala<br>145 | ata<br>Ile        | gaa<br>Glu        | aat<br>Asn        | atc<br>Ile        | aag<br>Lys        | aga<br>Arg<br>150 | ggt<br>Gly        | ctg<br>Leu        | gct<br>Ala        | 545  |
| agc<br>Ser<br>155 | cta<br>Leu        | ttt<br>Phe        | cag<br>Gln        | aca<br>Thr        | cag<br>Gln<br>160 | tta<br>Leu        | agc<br>Ser        | tct<br>Ser        | gga<br>Gly        | acc<br>Thr<br>165 | acc<br>Thr        | aat<br>Asn        | gag<br>Glu        | gta<br>Val        | gat<br>Asp        | 593  |
| atc<br>Ile<br>170 | tct<br>Ser        | gga<br>Gly        | aat<br>Asn        | tgt<br>Cys        | aaa<br>Lys<br>175 | gtg<br>Val        | acc<br>Thr        | tac<br>Tyr        | cag<br>Gln        | gct<br>Ala<br>180 | cat<br>His        | caa<br>Gln        | gac<br>Asp        | aaa<br>Lys        | gtg<br>Val<br>185 | 641  |
| atc<br>Ile        | aaa<br>Lys        | att<br>Ile        | aag<br>Lys        | gcc<br>Ala<br>190 | ttg<br>Leu        | gat<br>Asp        | tca<br>Ser        | tgc<br>Cys        | aaa<br>Lys<br>195 | ata<br>Ile        | gcg<br>Ala        | agg<br>Arg        | tct<br>Ser        | gga<br>Gly<br>200 | ttt<br>Phe        | 689  |
| acg<br>Thr        | acc<br>Thr        | cca<br>Pro        | aat<br>Asn<br>205 | cag<br>Gln        | gtc<br>Val        | ttg<br>Leu        | ggt<br>Gly        | gtc<br>Val<br>210 | agt<br>Ser        | tca<br>Ser        | aaa<br>Lys        | gct<br>Ala        | aca<br>Thr<br>215 | tct<br>Ser        | gtc<br>Val        | 737  |
| acc<br>Thr        | acc<br>Thr        | tat<br>Tyr<br>220 | aag<br>Lys        | ata<br>Ile        | gaa<br>Glu        | gac<br>Asp        | agc<br>Ser<br>225 | ttt<br>Phe        | gtt<br>Val        | ata<br>Ile        | gct<br>Ala        | gtg<br>Val<br>230 | ctt<br>Leu        | gct<br>Ala        | gaa<br>Glu        | 785  |
| gaa<br>Glu<br>235 | aca<br>Thr        | cac<br>His        | aat<br>Asn        | ttt<br>Phe        | gga<br>Gly        | ctg<br>Leu<br>240 | aat<br>Asn        | ttc<br>Phe        | cta<br>Leu        | caa<br>Gln        | acc<br>Thr<br>245 | att<br>Ile        | aag<br>Lys        | ggg<br>Gly        | aaa<br>Lys        | 833  |
| ata<br>Ile<br>250 | gta<br>Val        | tcg<br>Ser        | aag<br>Lys        | cag<br>Gln        | aaa<br>Lys<br>255 | tta<br>Leu        | gag<br>Glu        | ctg<br>Leu        | aag<br>Lys        | aca<br>Thr<br>260 | acc<br>Thr        | gaa<br>Glu        | gca<br>Ala        | ggc<br>Gly        | cca<br>Pro<br>265 | 881  |
| aga<br>Arg        | ttg<br>Leu        | atg<br>Met        | tct<br>Ser        | gga<br>Gly<br>270 | aag<br>Lys        | cag<br>Gln        | gct<br>Ala        | gca<br>Ala<br>275 | gcc<br>Ala        | ata<br>Ile        | atc<br>Ile        | aaa<br>Lys        | gca<br>Ala        | gtt<br>Val<br>280 | gat<br>Asp        | 929  |
| tca<br>Ser        | aag<br>Lys        | tac<br>Tyr        | acg<br>Thr<br>285 | gcc<br>Ala        | att<br>Ile        | ccc<br>Pro        | att<br>Ile        | gtg<br>Val<br>290 | ggg<br>Gly        | cag<br>Gln        | gtc<br>Val        | ttc<br>Phe        | cag<br>Gln<br>295 | agc<br>Ser        | cac<br>His        | 977  |
| tgt<br>Cys        | aaa<br>Lys        | gga<br>Gly<br>300 | tgt<br>Cys        | cct<br>Pro        | tct<br>Ser        | ctc<br>Leu        | tcg<br>Ser<br>305 | gag<br>Glu        | ctc<br>Leu        | tgg<br>Trp        | cgg<br>Arg        | tcc<br>Ser<br>310 | acc<br>Thr        | agg<br>Arg        | aaa<br>Lys        | 1025 |
| tac<br>Tyr        | ctg<br>Leu<br>315 | cag<br>Gln        | cct<br>Pro        | gac<br>Asp        | aac<br>Asn        | ctt<br>Leu<br>320 | tcc<br>Ser        | aag<br>Lys        | gct<br>Ala        | gag<br>Glu        | gct<br>Ala<br>325 | gtc<br>Val        | aga<br>Arg        | aac<br>Asn        | ttc<br>Phe        | 1073 |
| ctg<br>Leu<br>330 | gcc<br>Ala        | ttc<br>Phe        | att<br>Ile        | cag<br>Gln        | cac<br>His<br>335 | ctc<br>Leu        | agg<br>Arg        | act<br>Thr        | gcg<br>Ala        | aag<br>Lys<br>340 | aaa<br>Lys        | gaa<br>Glu        | gag<br>Glu        | atc<br>Ile        | ctt<br>Leu<br>345 | 1121 |
| caa<br>Gln        | ata<br>Ile        | cta<br>Leu        | aag<br>Lys        | atg<br>Met<br>350 | gaa<br>Glu        | aat<br>Asn        | aag<br>Lys        | gaa<br>Glu        | gta<br>Val<br>355 | tta<br>Leu        | cct<br>Pro        | cag<br>Gln        | ctg<br>Leu        | gtg<br>Val<br>360 | gat<br>Asp        | 1169 |

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| gct<br>Ala        | gtc<br>Val        | acc<br>Thr        | tct<br>Ser<br>365 | gct<br>Ala        | cag<br>Gln        | acc<br>Thr        | tca<br>Ser        | gac<br>Asp<br>370 | tca<br>Ser        | tta<br>Leu        | gaa<br>Glu        | gcc<br>Ala        | att<br>Ile<br>375 | ttg<br>Leu        | gac<br>Asp        | 1217 |
| ttt<br>Phe        | ttg<br>Leu        | gat<br>Asp<br>380 | ttc<br>Phe        | aaa<br>Lys        | agt<br>Ser        | gac<br>Asp        | agc<br>Ser<br>385 | agc<br>Ser        | att<br>Ile        | atc<br>Ile        | ctc<br>Leu        | cag<br>Gln<br>390 | gag<br>Glu        | agg<br>Arg        | ttt<br>Phe        | 1265 |
| ctc<br>Leu        | tat<br>Tyr<br>395 | gcc<br>Ala        | tgt<br>Cys        | gga<br>Gly        | ttt<br>Phe        | gct<br>Ala<br>400 | tct<br>Ser        | cat<br>His        | ccc<br>Pro        | aat<br>Asn        | gaa<br>Glu<br>405 | gaa<br>Glu        | ctc<br>Leu        | ctg<br>Leu        | aga<br>Arg        | 1313 |
| gcc<br>Ala<br>410 | ctc<br>Leu        | att<br>Ile        | agt<br>Ser        | aag<br>Lys        | ttc<br>Phe<br>415 | aaa<br>Lys        | ggt<br>Gly        | tct<br>Ser        | att<br>Ile        | ggt<br>Gly<br>420 | agc<br>Ser        | agt<br>Ser        | gac<br>Asp        | atc<br>Ile        | aga<br>Arg<br>425 | 1361 |
| gaa<br>Glu        | act<br>Thr        | gtt<br>Val        | atg<br>Met        | atc<br>Ile<br>430 | atc<br>Ile        | act<br>Thr        | ggg<br>Gly        | aca<br>Thr        | ctt<br>Leu<br>435 | gtc<br>Val        | aga<br>Arg        | aag<br>Lys        | ttg<br>Leu        | tgt<br>Cys<br>440 | cag<br>Gln        | 1409 |
| aat<br>Asn        | gaa<br>Glu        | ggc<br>Gly        | tgc<br>Cys<br>445 | aaa<br>Lys        | ctc<br>Leu        | aaa<br>Lys        | gca<br>Ala        | gta<br>Val<br>450 | gtg<br>Val        | gaa<br>Glu        | gct<br>Ala        | aag<br>Lys        | aag<br>Lys<br>455 | tta<br>Leu        | atc<br>Ile        | 1457 |
| ctg<br>Leu        | gga<br>Gly        | gga<br>Gly        | ctt<br>Leu        | gaa<br>Glu        | aaa<br>Lys        | gca<br>Ala        | gag<br>Glu<br>465 | aaa<br>Lys        | aaa<br>Lys        | gag<br>Glu        | gac<br>Asp        | acc<br>Thr<br>470 | agg<br>Arg        | atg<br>Met        | tat<br>Tyr        | 1505 |
| ctg<br>Leu<br>475 | ctg<br>Leu        | gct<br>Ala        | ttg<br>Leu        | aag<br>Lys        | aat<br>Asn        | gcc<br>Ala<br>480 | ctg<br>Leu        | ctt<br>Leu        | cca<br>Pro        | gaa<br>Glu        | ggc<br>Gly<br>485 | atc<br>Ile        | cca<br>Pro        | agt<br>Ser        | ctt<br>Leu        | 1553 |
| ctg<br>Leu<br>490 | aag<br>Lys        | tat<br>Tyr        | gca<br>Ala        | gaa<br>Glu        | gca<br>Ala<br>495 | gga<br>Gly        | gaa<br>Glu        | ggg<br>Gly        | ccc<br>Pro        | atc<br>Ile<br>500 | agc<br>Ser        | cac<br>His        | ctg<br>Leu        | gct<br>Ala        | acc<br>Thr<br>505 | 1601 |
| act<br>Thr        | gct<br>Ala        | ctc<br>Leu        | cag<br>Gln        | aga<br>Arg<br>510 | tat<br>Tyr        | gat<br>Asp        | ctc<br>Leu        | cct<br>Pro        | ttc<br>Phe<br>515 | ata<br>Ile        | act<br>Thr        | gat<br>Asp        | gag<br>Glu        | gtg<br>Val<br>520 | aag<br>Lys        | 1649 |
| aag<br>Lys        | acc<br>Thr        | tta<br>Leu        | aac<br>Asn<br>525 | aga<br>Arg        | ata<br>Ile        | tac<br>Tyr        | cac<br>His        | caa<br>Gln<br>530 | aac<br>Asn        | cgt<br>Arg        | aaa<br>Lys        | gtt<br>Val        | cat<br>His<br>535 | gaa<br>Glu        | aag<br>Lys        | 1697 |
| act<br>Thr        | gtg<br>Val        | cgc<br>Arg<br>540 | act<br>Thr        | gct<br>Ala        | gca<br>Ala        | gct<br>Ala        | gct<br>Ala<br>545 | atc<br>Ile        | att<br>Ile        | tta<br>Leu        | aat<br>Asn        | aac<br>Asn<br>550 | aat<br>Asn        | cca<br>Pro        | tcc<br>Ser        | 1745 |
| tac<br>Tyr<br>555 | atg<br>Met        | gac<br>Asp        | gtc<br>Val        | aag<br>Lys        | aac<br>Asn        | atc<br>Ile<br>560 | ctg<br>Leu        | ctg<br>Leu        | tct<br>Ser        | att<br>Ile        | ggg<br>Gly<br>565 | gag<br>Glu        | ctt<br>Leu        | ccc<br>Pro        | caa<br>Gln        | 1793 |
| gaa<br>Glu<br>570 | atg<br>Met        | aat<br>Asn        | aaa<br>Lys        | tac<br>Tyr        | atg<br>Met<br>575 | ctc<br>Leu        | gcc<br>Ala        | att<br>Ile        | gtt<br>Val        | caa<br>Gln<br>580 | gac<br>Asp        | atc<br>Ile        | cta<br>Leu        | cgt<br>Arg        | ttg<br>Leu<br>585 | 1841 |
| gaa<br>Glu        | atg<br>Met        | cct<br>Pro        | gca<br>Ala        | agc<br>Ser<br>590 | aaa<br>Lys        | att<br>Ile        | gtc<br>Val        | cgt<br>Arg<br>595 | cga<br>Arg        | gtt<br>Val        | ctg<br>Leu        | aag<br>Lys        | gaa<br>Glu        | atg<br>Met<br>600 | gtc<br>Val        | 1889 |
| gct<br>Ala        | cac<br>His        | aat<br>Asn        | tat<br>Tyr<br>605 | gac<br>Asp        | cgt<br>Arg        | ttc<br>Phe        | tcc<br>Ser        | agg<br>Arg<br>610 | agt<br>Ser        | gga<br>Gly        | tct<br>Ser        | tct<br>Ser        | tct<br>Ser<br>615 | gcc<br>Ala        | tac<br>Tyr        | 1937 |
| act<br>Thr        | ggc<br>Gly        | tac<br>Tyr<br>620 | ata<br>Ile        | gaa<br>Glu        | cgt<br>Arg        | agt<br>Ser        | ccc<br>Pro<br>625 | cgt<br>Arg        | tcg<br>Ser        | gca<br>Ala        | tct<br>Ser        | act<br>Thr<br>630 | tac<br>Tyr        | agc<br>Ser        | cta<br>Leu        | 1985 |

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|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
| gac<br>Asp        | att<br>Ile<br>635 | ctc<br>Leu        | tac<br>Tyr        | tcg<br>Ser        | ggg<br>Gly<br>640 | tct<br>Ser        | ggc<br>Gly        | att<br>Ile        | cta<br>Leu        | agg<br>Arg        | aga<br>Arg<br>645 | agt<br>Ser        | aac<br>Asn        | ctg<br>Leu        | aac<br>Asn        | 2033 |
| atc<br>Ile<br>650 | ttt<br>Phe        | cag<br>Gln        | tac<br>Tyr        | att<br>Ile        | ggg<br>Gly<br>655 | aag<br>Lys        | gct<br>Ala        | ggg<br>Gly        | ctt<br>Leu        | cac<br>His<br>660 | ggg<br>Gly        | agc<br>Ser        | cag<br>Gln        | gtg<br>Val        | gtt<br>Val<br>665 | 2081 |
| att<br>Ile        | gaa<br>Glu        | gcc<br>Ala        | caa<br>Gln        | gga<br>Gly<br>670 | ctg<br>Leu        | gaa<br>Glu        | gcc<br>Ala        | tta<br>Leu        | atc<br>Ile<br>675 | gca<br>Ala        | gcc<br>Ala        | acc<br>Thr        | cct<br>Pro        | gac<br>Asp<br>680 | gag<br>Glu        | 2129 |
| ggg<br>Gly        | gag<br>Glu        | gag<br>Glu        | aac<br>Asn<br>685 | ctt<br>Leu        | gac<br>Asp        | tcc<br>Ser        | tat<br>Tyr        | gct<br>Ala<br>690 | ggg<br>Gly        | atg<br>Met        | tca<br>Ser        | gcc<br>Ala        | atc<br>Ile<br>695 | ctc<br>Leu        | ttt<br>Phe        | 2177 |
| gat<br>Asp        | gtt<br>Val        | cag<br>Gln<br>700 | ctc<br>Leu        | aga<br>Arg        | cct<br>Pro        | gtc<br>Val        | acc<br>Thr<br>705 | ttt<br>Phe        | ttc<br>Phe        | aac<br>Asn        | gga<br>Gly        | tac<br>Tyr<br>710 | agt<br>Ser        | gat<br>Asp        | ttg<br>Leu        | 2225 |
| atg<br>Met<br>715 | tcc<br>Ser        | aaa<br>Lys        | atg<br>Met        | ctg<br>Leu        | tca<br>Ser        | gca<br>Ala<br>720 | tct<br>Ser        | ggc<br>Gly        | gac<br>Asp        | cct<br>Pro        | atc<br>Ile<br>725 | agt<br>Ser        | gtg<br>Val        | gtg<br>Val        | aaa<br>Lys        | 2273 |
| gga<br>Gly<br>730 | ctt<br>Leu        | att<br>Ile        | ctg<br>Leu        | cta<br>Leu        | ata<br>Ile<br>735 | gat<br>Asp        | cat<br>His        | tct<br>Ser        | cag<br>Gln        | gaa<br>Glu<br>740 | ctt<br>Leu        | cag<br>Gln        | tta<br>Leu        | caa<br>Gln        | tct<br>Ser<br>745 | 2321 |
| gga<br>Gly        | cta<br>Leu        | aaa<br>Lys        | gcc<br>Ala        | aat<br>Asn<br>750 | ata<br>Ile        | gag<br>Glu        | gtc<br>Val        | cag<br>Gln        | ggg<br>Gly<br>755 | ggg<br>Gly        | cta<br>Leu        | gct<br>Ala        | att<br>Ile        | gat<br>Asp<br>760 | att<br>Ile        | 2369 |
| tca<br>Ser        | ggg<br>Gly        | gca<br>Ala        | atg<br>Met<br>765 | gag<br>Glu        | ttt<br>Phe        | agc<br>Ser        | ttg<br>Leu        | tgg<br>Trp<br>770 | tat<br>Tyr        | cgt<br>Arg        | gag<br>Glu        | tct<br>Ser        | aaa<br>Lys<br>775 | acc<br>Thr        | cga<br>Arg        | 2417 |
| gtg<br>Val        | aaa<br>Lys        | aat<br>Asn<br>780 | agg<br>Arg        | gtg<br>Val        | act<br>Thr        | gtg<br>Val        | gta<br>Val<br>785 | ata<br>Ile        | acc<br>Thr        | act<br>Thr        | gac<br>Asp        | atc<br>Ile<br>790 | aca<br>Thr        | gtg<br>Val        | gac<br>Asp        | 2465 |
| tcc<br>Ser<br>795 | tct<br>Ser        | ttt<br>Phe        | gtg<br>Val        | aaa<br>Lys        | gct<br>Ala        | ggc<br>Gly<br>800 | ctg<br>Leu        | gaa<br>Glu        | acc<br>Thr        | agt<br>Ser        | aca<br>Thr<br>805 | gaa<br>Glu        | aca<br>Thr        | gaa<br>Glu        | gca<br>Ala        | 2513 |
| ggc<br>Gly<br>810 | ttg<br>Leu        | gag<br>Glu        | ttt<br>Phe        | atc<br>Ile        | tcc<br>Ser<br>815 | aca<br>Thr        | gtg<br>Val        | cag<br>Gln        | ttt<br>Phe        | tct<br>Ser<br>820 | cag<br>Gln        | tac<br>Tyr        | cca<br>Pro        | ttc<br>Phe        | tta<br>Leu<br>825 | 2561 |
| gtt<br>Val        | tgc<br>Cys        | atg<br>Met        | cag<br>Gln        | atg<br>Met<br>830 | gac<br>Asp        | aag<br>Lys        | gat<br>Asp        | gaa<br>Glu        | gct<br>Ala<br>835 | cca<br>Pro        | ttc<br>Phe        | agg<br>Arg        | caa<br>Gln        | ttt<br>Phe<br>840 | gag<br>Glu        | 2609 |
| aaa<br>Lys        | aag<br>Lys        | tac<br>Tyr        | gaa<br>Glu<br>845 | agg<br>Arg        | ctg<br>Leu        | tcc<br>Ser        | aca<br>Thr        | ggc<br>Gly<br>850 | aga<br>Arg        | ggg<br>Gly        | tat<br>Tyr        | gtc<br>Val        | tct<br>Ser<br>855 | cag<br>Gln        | aaa<br>Lys        | 2657 |
| aga<br>Arg        | aaa<br>Lys        | gaa<br>Glu<br>860 | agc<br>Ser        | gta<br>Val        | tta<br>Leu        | gca<br>Ala        | gga<br>Gly<br>865 | tgt<br>Cys        | gaa<br>Glu        | ttc<br>Phe        | ccg<br>Pro        | ctc<br>Leu<br>870 | cat<br>His        | caa<br>Gln        | gag<br>Glu        | 2705 |
| aac<br>Asn<br>875 | tca<br>Ser        | gag<br>Glu        | atg<br>Met        | tgc<br>Cys        | aaa<br>Lys        | gtg<br>Val<br>880 | gtg<br>Val        | ttt<br>Phe        | gcc<br>Ala        | cct<br>Pro        | cag<br>Gln<br>885 | ccg<br>Pro        | gat<br>Asp        | agt<br>Ser        | act<br>Thr        | 2753 |
| tcc<br>Ser<br>890 | agc<br>Ser        | gga<br>Gly        | tgg<br>Trp        | ttt<br>Phe        | tga               | aactgacctg        | tgatatttta        | cttgaatttg        |                   |                   |                   |                   |                   |                   |                   | 2801 |
| tctccccgaa        | agggacacaa        | tgtggcatga        | ctaagtactt        | gctctctgag        | agcacagcgt        |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   | 2861 |

|          |      |          |     |          |      |          |       |          |       |          |      |      |
|----------|------|----------|-----|----------|------|----------|-------|----------|-------|----------|------|------|
| ttacatat | ttt  | acctgtat | ttt | aagatttt | ttg  | taaaaag  | cta   | caaaaaa  | actg  | cagtttg  | atc  | 2921 |
| aaatttt  | gggt | atatgcag | ta  | tgctaccc | ac   | agcgtc   | attt  | tgaatcat | ca    | tgtgacg  | cctt | 2981 |
| tcaacaac | gt   | tcttagtt | ta  | cttatacc | tc   | tctcaa   | atct  | catttggt | ac    | agtcaga  | aata | 3041 |
| gttattct | ct   | aagaggaa | ac  | tagtgttt | gt   | taaaaaca | aaa   | aataaaaa | aca   | aaaccac  | aca  | 3101 |
| aggagaac | ccc  | aattttgt | tt  | caacaatt | ttt  | tgatca   | aatgt | atatga   | agct  | cttgata  | agga | 3161 |
| cttcctta | ag   | catgacgg | ga  | aaaccaa  | aca  | cgttcc   | cctaa | tcaggaaa | aaaa  | aaaaaaaa |      | 3221 |
| aaaaagta | ag   | acacaaac | aa  | accatttt | ttt  | tctcttt  | tttt  | tggagt   | ttggg | ggcccag  | ggga | 3281 |
| gaagggac | aa   | ggctttta | aaa | agactt   | gtta | gccaact  | tca   | agaatta  | aata  | tttatgt  | ctc  | 3341 |
| tgttatt  | gtt  | agtttta  | agc | cttaagg  | tag  | aaggcac  | ata   | gaaataa  | cat   | c        |      | 3392 |

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Cys Phe Phe Ser Ser Tyr Ser Ala Ser Val Lys Gly His Thr Thr Gly  
10 15 20 25

ctc tca tta aat aat gag cgg cta tac aag ctc acg tac tcc act gaa 147  
Leu Ser Leu Asn Asn Glu Arg Leu Tyr Lys Leu Thr Tyr Ser Thr Glu  
30 35 40

gtg ttt ctt gat ggg ggc aaa gga aaa ccg caa gac agc gtg ggc tac 195  
Val Phe Leu Asp Gly Gly Lys Gly Lys Pro Gln Asp Ser Val Gly Tyr  
45 50 55

aaa atc tca tct gat gtg gac gtt gtg tta ctg tgg agg aat cct gat 243  
Lys Ile Ser Ser Asp Val Asp Val Val Leu Leu Trp Arg Asn Pro Asp  
60 65 70

ggc gat gat gat caa gtg atc caa gtc acg ata aca gct gtt aac gtt 291  
Gly Asp Asp Asp Gln Val Ile Gln Val Thr Ile Thr Ala Val Asn Val  
75 80 85

gaa aat gcg ggt caa cag aga ggc gag aag agc atc ttc cag ggc aaa 339  
Glu Asn Ala Gly Gln Gln Arg Gly Glu Lys Ser Ile Phe Gln Gly Lys  
90 95 100 105

agt aca cct aag atc ata ggg aag gac aac ctg gag gct ctg cag aga 387  
Ser Thr Pro Lys Ile Ile Gly Lys Asp Asn Leu Glu Ala Leu Gln Arg  
110 115 120

ccc atg ctt ctt cat ctg gtc cgg ggg aag gtc aag gag ttc tac tcc 435  
Pro Met Leu Leu His Leu Val Arg Gly Lys Val Lys Glu Phe Tyr Ser  
125 130 135

tat gaa aac gag cca gtg ggc ata gaa aat ctc aag aga ggc ttg gct 483  
Tyr Glu Asn Glu Pro Val Gly Ile Glu Asn Leu Lys Arg Gly Leu Ala  
140 145 150

agc tta ttc cag atg cag cta agc tct gga act acc aac gag gta gat 531  
Ser Leu Phe Gln Met Gln Leu Ser Ser Gly Thr Thr Asn Glu Val Asp  
155 160 165

atc tct ggg gat tgt aaa gtg acc tac cag gcc caa caa gac aaa gtg 579  
Ile Ser Gly Asp Cys Lys Val Thr Tyr Gln Ala Gln Gln Asp Lys Val  
170 175 180 185

gtc aaa att aag gct ctg gat aca tgc aaa att gag cgg tct gga ttt 627  
Val Lys Ile Lys Ala Leu Asp Thr Cys Lys Ile Glu Arg Ser Gly Phe  
190 195 200

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| aca | acg | gca | aac | cag | gtg | ctg | ggc | gtc | agt | tca | aaa | gcc | aca | tct | gtc | 675  |
| Thr | Thr | Ala | Asn | Gln | Val | Leu | Gly | Val | Ser | Ser | Lys | Ala | Thr | Ser | Val |      |
|     |     |     | 205 |     |     |     |     | 210 |     |     |     |     | 215 |     |     |      |
| act | acc | tac | aag | ata | gag | gac | agc | ttt | gtc | acc | gct | gtg | ctt | gca | gaa | 723  |
| Thr | Thr | Tyr | Lys | Ile | Glu | Asp | Ser | Phe | Val | Thr | Ala | Val | Leu | Ala | Glu |      |
|     |     | 220 |     |     |     |     | 225 |     |     |     |     | 230 |     |     |     |      |
| gag | acc | agg | gct | ttt | gcc | ttg | aac | ttc | caa | caa | acc | ata | gca | gga | aaa | 771  |
| Glu | Thr | Arg | Ala | Phe | Ala | Leu | Asn | Phe | Gln | Gln | Thr | Ile | Ala | Gly | Lys |      |
|     | 235 |     |     |     |     | 240 |     |     |     |     | 245 |     |     |     |     |      |
| ata | gtg | tca | aag | cag | aaa | ttg | gag | ctg | aag | aca | act | gaa | gcc | ggc | cca | 819  |
| Ile | Val | Ser | Lys | Gln | Lys | Leu | Glu | Leu | Lys | Thr | Thr | Glu | Ala | Gly | Pro |      |
| 250 |     |     |     |     | 255 |     |     |     |     | 260 |     |     |     |     | 265 |      |
| agg | atg | atc | ccc | ggg | aag | caa | gtg | gca | ggg | gta | att | aaa | gca | gtt | gat | 867  |
| Arg | Met | Ile | Pro | Gly | Lys | Gln | Val | Ala | Gly | Val | Ile | Lys | Ala | Val | Asp |      |
|     |     |     |     | 270 |     |     |     |     | 275 |     |     |     |     | 280 |     |      |
| tcc | aaa | tac | aaa | gcc | att | ccc | att | gtg | gga | cag | gtc | ctc | gag | cgt | gtc | 915  |
| Ser | Lys | Tyr | Lys | Ala | Ile | Pro | Ile | Val | Gly | Gln | Val | Leu | Glu | Arg | Val |      |
|     |     |     | 285 |     |     |     |     | 290 |     |     |     |     | 295 |     |     |      |
| tgc | aaa | gga | tgc | cct | tct | ctg | gcg | gag | cac | tgg | aag | tcc | atc | aga | aag | 963  |
| Cys | Lys | Gly | Cys | Pro | Ser | Leu | Ala | Glu | His | Trp | Lys | Ser | Ile | Arg | Lys |      |
|     |     | 300 |     |     |     |     | 305 |     |     |     |     | 310 |     |     |     |      |
| aac | ctg | gag | cct | gaa | aac | ctg | tcc | aag | gcc | gag | gct | gtc | cag | agc | ttc | 1011 |
| Asn | Leu | Glu | Pro | Glu | Asn | Leu | Ser | Lys | Ala | Glu | Ala | Val | Gln | Ser | Phe |      |
|     | 315 |     |     |     |     | 320 |     |     |     |     | 325 |     |     |     |     |      |
| ctg | gcc | ttc | atc | cag | cac | ctc | cgg | act | tcg | agg | aga | gaa | gag | atc | ctc | 1059 |
| Leu | Ala | Phe | Ile | Gln | His | Leu | Arg | Thr | Ser | Arg | Arg | Glu | Glu | Ile | Leu |      |
| 330 |     |     |     |     | 335 |     |     |     |     | 340 |     |     |     |     | 345 |      |
| cag | att | ctg | aag | gca | gag | aag | aaa | gaa | gtg | ctc | cct | cag | ctg | gtg | gat | 1107 |
| Gln | Ile | Leu | Lys | Ala | Glu | Lys | Lys | Glu | Val | Leu | Pro | Gln | Leu | Val | Asp |      |
|     |     |     |     | 350 |     |     |     |     | 355 |     |     |     |     | 360 |     |      |
| gcc | gtc | acc | tct | gct | cag | act | cca | gac | tcg | cta | gaa | gcc | atc | ctg | gac | 1155 |
| Ala | Val | Thr | Ser | Ala | Gln | Thr | Pro | Asp | Ser | Leu | Glu | Ala | Ile | Leu | Asp |      |
|     |     |     | 365 |     |     |     |     | 370 |     |     |     |     | 375 |     |     |      |
| ttt | ttg | gat | ttc | aaa | agt | gac | agc | agt | atc | ata | ctc | cag | gaa | agg | ttc | 1203 |
| Phe | Leu | Asp | Phe | Lys | Ser | Asp | Ser | Ser | Ile | Ile | Leu | Gln | Glu | Arg | Phe |      |
|     |     | 380 |     |     |     |     | 385 |     |     |     |     | 390 |     |     |     |      |
| ctc | tat | gcc | tgt | ggc | ttt | gcc | acc | cac | cct | gat | gaa | gaa | ctc | cta | cga | 1251 |
| Leu | Tyr | Ala | Cys | Gly | Phe | Ala | Thr | His | Pro | Asp | Glu | Glu | Leu | Leu | Arg |      |
|     | 395 |     |     |     |     | 400 |     |     |     |     | 405 |     |     |     |     |      |
| gcc | ctc | ctt | agt | aag | ttc | aaa | ggg | tcc | ttt | gca | agc | aac | gac | atc | aga | 1299 |
| Ala | Leu | Leu | Ser | Lys | Phe | Lys | Gly | Ser | Phe | Ala | Ser | Asn | Asp | Ile | Arg |      |
| 410 |     |     |     |     | 415 |     |     |     |     | 420 |     |     |     |     | 425 |      |
| gag | tcg | gtt | atg | atc | atc | att | gga | gcc | cta | gtc | agg | aag | ctg | tgt | cag | 1347 |
| Glu | Ser | Val | Met | Ile | Ile | Ile | Gly | Ala | Leu | Val | Arg | Lys | Leu | Cys | Gln |      |
|     |     |     |     | 430 |     |     |     |     | 435 |     |     |     |     | 440 |     |      |
| aat | gaa | ggc | tgc | aag | ctc | aag | gca | gtg | gtg | gaa | gct | aag | aag | ctg | atc | 1395 |
| Asn | Glu | Gly | Cys | Lys | Leu | Lys | Ala | Val | Val | Glu | Ala | Lys | Lys | Leu | Ile |      |
|     |     |     | 445 |     |     |     |     | 450 |     |     |     |     | 455 |     |     |      |
| ctg | gga | gga | ctt | gaa | aaa | cca | gag | aag | aaa | gaa | gac | acc | aca | atg | tac | 1443 |
| Leu | Gly | Gly | Leu | Glu | Lys | Pro | Glu | Lys | Lys | Glu | Asp | Thr | Thr | Met | Tyr |      |
|     |     | 460 |     |     |     |     | 465 |     |     |     |     | 470 |     |     |     |      |
| ctg | ctg | gcc | ctg | aag | aat | gcc | ttg | ctt | ccc | gaa | ggc | atc | ccg | ctc | ctt | 1491 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Leu | Leu | Ala | Leu | Lys | Asn | Ala | Leu | Leu | Pro | Glu | Gly | Ile | Pro | Leu | Leu |      |
|     | 475 |     |     |     |     | 480 |     |     |     |     | 485 |     |     |     |     |      |
| ctg | aag | tat | gct | gag | gct | gga | gaa | ggg | ccc | gtc | agc | cac | ctg | gcc | acc | 1539 |
| Leu | Lys | Tyr | Ala | Glu | Ala | Gly | Glu | Gly | Pro | Val | Ser | His | Leu | Ala | Thr |      |
| 490 |     |     |     |     | 495 |     |     |     |     | 500 |     |     |     |     | 505 |      |
| act | gtt | ctc | cag | aga | tac | gat | gtc | tcc | ttc | atc | aca | gat | gag | gtg | aag | 1587 |
| Thr | Val | Leu | Gln | Arg | Tyr | Asp | Val | Ser | Phe | Ile | Thr | Asp | Glu | Val | Lys |      |
|     |     |     |     | 510 |     |     |     |     | 515 |     |     |     |     | 520 |     |      |
| aag | acc | ttg | aac | agg | ata | tac | cac | cag | aat | cgt | aag | gtt | cat | gag | aag | 1635 |
| Lys | Thr | Leu | Asn | Arg | Ile | Tyr | His | Gln | Asn | Arg | Lys | Val | His | Glu | Lys |      |
|     |     |     | 525 |     |     |     |     | 530 |     |     |     |     | 535 |     |     |      |
| acg | gtg | cgc | aca | act | gcc | gct | gct | gtc | atc | tta | aag | aac | cca | tcc | tac | 1683 |
| Thr | Val | Arg | Thr | Thr | Ala | Ala | Ala | Val | Ile | Leu | Lys | Asn | Pro | Ser | Tyr |      |
|     |     | 540 |     |     |     | 545 |     |     |     |     |     | 550 |     |     |     |      |
| atg | gat | gtg | aag | aac | atc | ctg | ctg | tcc | att | ggg | gaa | ctc | ccg | aaa | gag | 1731 |
| Met | Asp | Val | Lys | Asn | Ile | Leu | Leu | Ser | Ile | Gly | Glu | Leu | Pro | Lys | Glu |      |
|     | 555 |     |     |     |     | 560 |     |     |     |     | 565 |     |     |     |     |      |
| atg | aac | aaa | tac | atg | ctc | acc | gtt | gtg | caa | gac | atc | ctg | cat | ttt | gaa | 1779 |
| Met | Asn | Lys | Tyr | Met | Leu | Thr | Val | Val | Gln | Asp | Ile | Leu | His | Phe | Glu |      |
|     | 570 |     |     |     | 575 |     |     |     |     | 580 |     |     |     |     | 585 |      |
| atg | cct | gca | agc | aaa | atg | atc | cgt | cga | gtt | ctc | aag | gag | atg | gct | gtt | 1827 |
| Met | Pro | Ala | Ser | Lys | Met | Ile | Arg | Arg | Val | Leu | Lys | Glu | Met | Ala | Val |      |
|     |     |     |     | 590 |     |     |     |     | 595 |     |     |     |     | 600 |     |      |
| cac | aat | tat | gac | cgt | ttc | tcc | aag | agt | gga | tcc | tct | tct | gcc | tat | act | 1875 |
| His | Asn | Tyr | Asp | Arg | Phe | Ser | Lys | Ser | Gly | Ser | Ser | Ser | Ala | Tyr | Thr |      |
|     |     |     | 605 |     |     |     |     | 610 |     |     |     |     | 615 |     |     |      |
| ggc | tac | gta | gaa | cgt | agc | ccc | cgt | gca | gcg | tcc | aca | tac | agc | ctt | gac | 1923 |
| Gly | Tyr | Val | Glu | Arg | Ser | Pro | Arg | Ala | Ala | Ser | Thr | Tyr | Ser | Leu | Asp |      |
|     |     | 620 |     |     |     |     | 625 |     |     |     |     | 630 |     |     |     |      |
| atc | ctt | tac | tct | ggc | tct | ggc | att | ctg | agg | aga | agt | aac | ctg | aac | atc | 1971 |
| Ile | Leu | Tyr | Ser | Gly | Ser | Gly | Ile | Leu | Arg | Arg | Ser | Asn | Leu | Asn | Ile |      |
|     | 635 |     |     |     |     | 640 |     |     |     |     | 645 |     |     |     |     |      |
| ttc | cag | tac | atc | aaa | gga | aca | gag | ctt | cat | ggt | agt | cag | gtg | gtg | att | 2019 |
| Phe | Gln | Tyr | Ile | Lys | Gly | Thr | Glu | Leu | His | Gly | Ser | Gln | Val | Val | Ile |      |
|     | 650 |     |     |     | 655 |     |     |     |     | 660 |     |     |     |     | 665 |      |
| gaa | gcc | caa | ggg | ctg | gaa | ggc | tta | att | gca | gcc | act | cct | gat | gaa | gga | 2067 |
| Glu | Ala | Gln | Gly | Leu | Glu | Gly | Leu | Ile | Ala | Ala | Thr | Pro | Asp | Glu | Gly |      |
|     |     |     |     | 670 |     |     |     |     | 675 |     |     |     |     | 680 |     |      |
| gag | gag | aac | ctt | gac | tct | tat | gct | ggc | atg | tca | gcc | atc | ctg | ttt | gat | 2115 |
| Glu | Glu | Asn | Leu | Asp | Ser | Tyr | Ala | Gly | Met | Ser | Ala | Ile | Leu | Phe | Asp |      |
|     |     |     | 685 |     |     |     |     | 690 |     |     |     |     | 695 |     |     |      |
| gtt | cag | ctt | agg | cct | gtc | aca | ttt | ttt | aat | gga | tac | agt | gat | ttg | atg | 2163 |
| Val | Gln | Leu | Arg | Pro | Val | Thr | Phe | Phe | Asn | Gly | Tyr | Ser | Asp | Leu | Met |      |
|     |     | 700 |     |     |     |     | 705 |     |     |     |     | 710 |     |     |     |      |
| tcc | aaa | atg | ctg | tcg | gca | tcc | ggc | gac | cct | gtc | agc | gtg | gtg | aaa | ggg | 2211 |
| Ser | Lys | Met | Leu | Ser | Ala | Ser | Gly | Asp | Pro | Val | Ser | Val | Val | Lys | Gly |      |
|     | 715 |     |     |     |     | 720 |     |     |     |     | 725 |     |     |     |     |      |
| ctt | att | ctg | tta | ata | gac | cat | tct | cag | gat | att | cag | ctg | caa | tct | gga | 2259 |
| Leu | Ile | Leu | Leu | Ile | Asp | His | Ser | Gln | Asp | Ile | Gln | Leu | Gln | Ser | Gly |      |
|     |     |     |     |     | 735 |     |     |     |     | 740 |     |     |     |     | 745 |      |
| cta | aag | gcc | aat | atg | gag | atc | cag | ggt | ggt | cta | gct | att | gat | att | tct | 2307 |
| Leu | Lys | Ala | Asn | Met | Glu | Ile | Gln | Gly | Gly | Leu | Ala | Ile | Asp | Ile | Ser |      |



| 750        |            |            |            |            | 755        |            |            |            |     | 760 |     |     |     |     |     |      |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----|-----|-----|-----|-----|-----|-----|------|
| ggt        | tca        | atg        | gaa        | ttc        | agt        | ctg        | tgg        | tat        | cgc | gag | tct | aaa | acc | cga | gtg | 2355 |
| Gly        | Ser        | Met        | Glu        | Phe        | Ser        | Leu        | Trp        | Tyr        | Arg | Glu | Ser | Lys | Thr | Arg | Val |      |
|            |            |            | 765        |            |            |            |            | 770        |     |     |     | 775 |     |     |     |      |
| aaa        | aat        | cgg        | gtg        | gct        | gtg        | gtg        | ata        | acc        | agc | gac | gtc | aca | gtg | gat | gcc | 2403 |
| Lys        | Asn        | Arg        | Val        | Ala        | Val        | Val        | Ile        | Thr        | Ser | Asp | Val | Thr | Val | Asp | Ala |      |
|            |            | 780        |            |            |            |            | 785        |            |     |     |     | 790 |     |     |     |      |
| tct        | ttt        | gtg        | aaa        | gct        | ggc        | ctg        | gaa        | agc        | aga | gcg | gag | aca | gag | gct | ggg | 2451 |
| Ser        | Phe        | Val        | Lys        | Ala        | Gly        | Leu        | Glu        | Ser        | Arg | Ala | Glu | Thr | Glu | Ala | Gly |      |
|            | 795        |            |            |            |            | 800        |            |            |     |     | 805 |     |     |     |     |      |
| ctg        | gag        | ttc        | atc        | tcc        | aca        | gtg        | cag        | ttc        | tca | cag | tac | ccg | ttc | ttg | gtc | 2499 |
| Leu        | Glu        | Phe        | Ile        | Ser        | Thr        | Val        | Gln        | Phe        | Ser | Gln | Tyr | Pro | Phe | Leu | Val |      |
| 810        |            |            |            |            | 815        |            |            |            |     | 820 |     |     |     |     | 825 |      |
| tgc        | atg        | cag        | atg        | gac        | aag        | gct        | gaa        | gcc        | cca | ctc | agg | caa | ttc | gag | aca | 2547 |
| Cys        | Met        | Gln        | Met        | Asp        | Lys        | Ala        | Glu        | Ala        | Pro | Leu | Arg | Gln | Phe | Glu | Thr |      |
|            |            |            |            | 830        |            |            |            |            | 835 |     |     |     |     | 840 |     |      |
| aag        | tat        | gaa        | agg        | cta        | tct        | aca        | ggc        | agg        | gga | tat | gtc | tct | cgg | aga | aga | 2595 |
| Lys        | Tyr        | Glu        | Arg        | Leu        | Ser        | Thr        | Gly        | Arg        | Gly | Tyr | Val | Ser | Arg | Arg | Arg |      |
|            |            |            | 845        |            |            |            |            | 850        |     |     |     |     | 855 |     |     |      |
| aaa        | gag        | agc        | cta        | gtg        | gcc        | gga        | tgt        | gaa        | ctc | ccc | ctc | cat | caa | cag | aac | 2643 |
| Lys        | Glu        | Ser        | Leu        | Val        | Ala        | Gly        | Cys        | Glu        | Leu | Pro | Leu | His | Gln | Gln | Asn |      |
|            |            | 860        |            |            |            |            | 865        |            |     |     |     | 870 |     |     |     |      |
| tct        | gag        | atg        | tgc        | aac        | gtg        | gta        | ttc        | cca        | cct | cag | cca | gaa | agc | gat | aac | 2691 |
| Ser        | Glu        | Met        | Cys        | Asn        | Val        | Val        | Phe        | Pro        | Pro | Gln | Pro | Glu | Ser | Asp | Asn |      |
|            | 875        |            |            |            |            | 880        |            |            |     |     | 885 |     |     |     |     |      |
| tcc        | ggc        | gga        | tgg        | ttt        | tga        | ttcccgtggg | ttcccttcca | ccagaacgat |     |     |     |     |     |     |     | 2739 |
| Ser        | Gly        | Gly        | Trp        | Phe        |            |            |            |            |     |     |     |     |     |     |     |      |
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